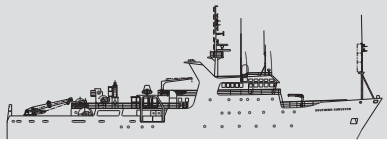

MARINE
NATIONAL FACILITY

2009 program

RV *Southern Surveyor*

voyageplan
SS2-2009

Hydrothermal plume and structural geology mapping in the Tonga/Fiji region

Itinerary
(all times are local)

SS02/2009 Leg 1
Onboard inductions and meetings for project staff Mon 20 April 2009.
Mobilise Lautoka (Fiji) 0700hrs, Tues 21 April 2009 and clear Fiji outwards.
Sail Lautoka 0820hrs, Wed 22 April 2009.
Arrive Nuku'alofa (Tonga) 1500hrs, Mon 18 May 2009 and clear Tonga inwards.

Port period in Nuku'alofa (Tonga) Tues 19 May 2009 to Wed 27 May 2009.

SS02/2009 Leg 2
Onboard inductions and meetings for project staff Thur 28 May 2009.
Clear Tonga outwards and sail Nuku'alofa (Tonga) 1000hrs, Fri 29 May 2009.
Arrive Lautoka (Fiji) 1000hrs, Thurs 25 June 2009, clear Fiji inwards and demobilise.

CSIRO

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Chief Scientist Leg 1: Gary Massoth

Chief Scientist Leg 2: Richard Arculus

Scientific Objectives

The fundamental scientific objective of this voyage is to help gain a greater understanding of ocean floor tectonics and magma activity at the boundary of the Australian and Pacific plates. Previous research voyages have indicated that this area is tectonically and structurally complex and is very active from a volcanic and hydrothermal aspect. This voyage will gather more detail about this activity to help generate an improved model of the current activity and historical construction of this unique part of the Earth's crust. The uniqueness of this area relates to the fact that this major plate margin represents the most rapid centre of crustal spreading on the planet and hence makes a great laboratory for how new crust forms and reacts in such an environment.

Voyage Objectives

The core objective is to use water column chemistry and bathymetric mapping tools in order identify the tectonic and volcanic features that have are most likely to host hydrothermal systems. Hydrothermal sites will be specifically targeted with camera tow and dredge operations to identify and collect rock samples that will be analysed later in laboratories.

More specifically:

1. Integrate multibeam and plume hunting data to generate high confidence prioritized targets for first pass assessment using the camera tow/grabber/ dredge.

2. Implement, assess and improve plume hunting techniques to increase confidence in finding the source of the plumes using CTD and water sampling techniques.

3. Gather multibeam data in areas where there is no data and integrate into current database.

4. Optimize the real-time tow-yo and MAPR data processing to refine target foot print.
   a. Use dNTU, eh, pH and filtrates to vector into target source with cross tow and casts.

5. Optimise the real-time multibeam data processing to refine target foot print
   a. CARIS and CUBE algorithms.

In regard to sampling operations, the equipment priorities that flow from the voyage objectives are:

1. CTD sensor data and water collection

2. Swath mapping data

3. Camera data (user supplied and operated)

4. Rock dredge samples

Post Voyage Objectives:

1. Submit filtrate samples for ICP-MS analysis to increase knowledge of the style of hydrothermal sources.

2. Submit water samples for helium analysis to help define regional hydrothermal distribution.

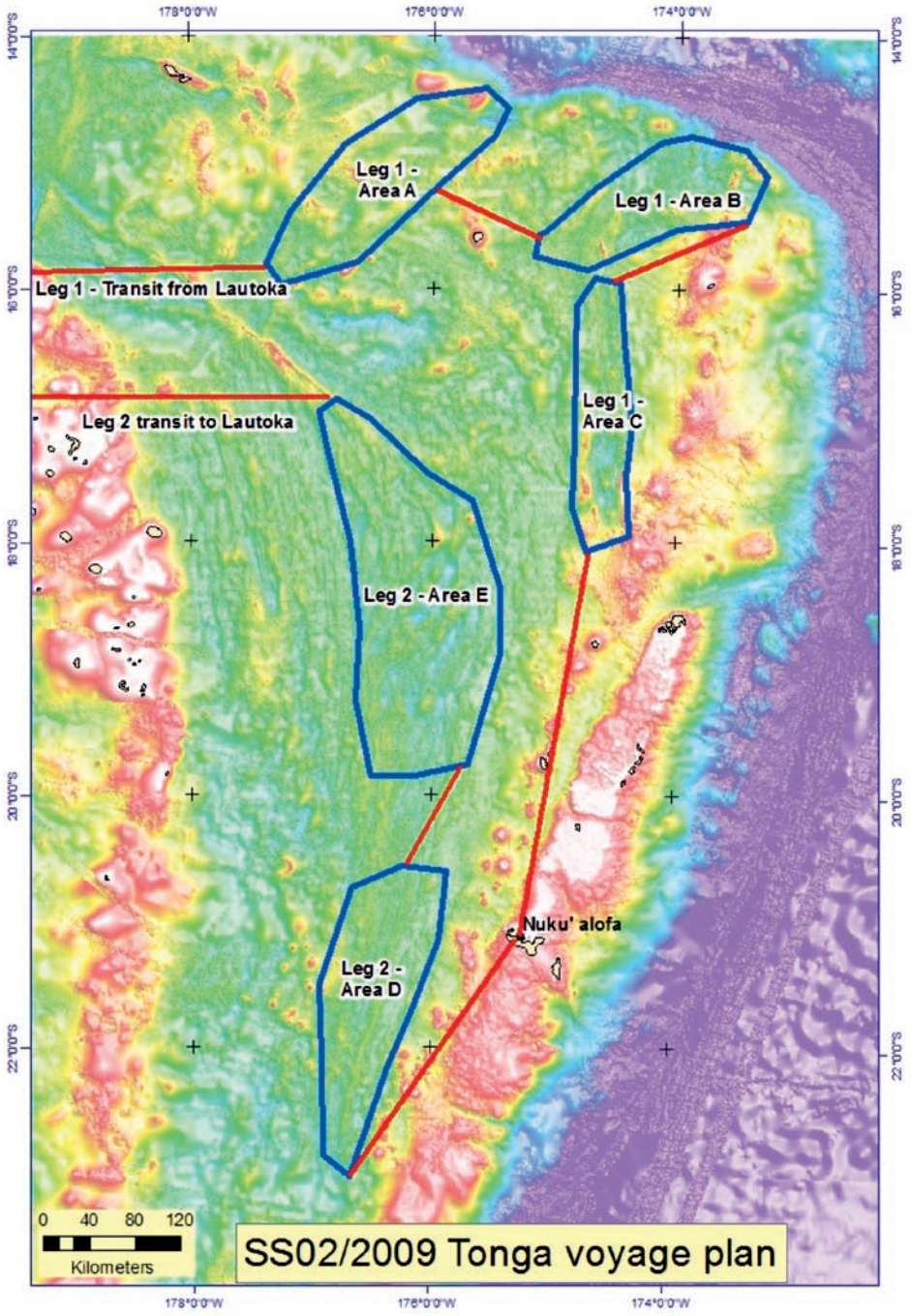
3. Re-process CTD and MAPR data to generate subtle temperature anomalies.

4. Integrate all plume hunting data into central database using sound database management principles.

Voyage Track

Fiji has provided an observer for Leg 1, therefore work undertaken in Fijian waters is scheduled for Leg 1.

Figure 1. Voyage track and areas of interest for SS02/2009 in the Tongan/Fiji region.



Time Estimates

Transit: 5 Days
CTD Tow Yo's: 25 Days
Camera & Rock Dredge: 9 Days
Swath Mapping: 15 Days.

Onboard Management Roles

Onboard management of this voyage will follow the normal structure for MNF research voyages involving three key roles of Master, Voyage Manager and Chief Scientist.

The Vessel Master is responsible for the safety of the vessel and all personnel onboard. The Master is also responsible for the supervision and direction of the crew of the vessel.

The CSIRO's MNF Voyage Manager is responsible for representing the Marine National Facilities interest's during research voyages and for liaison between the vessel (through the Master) and the Scientific Party (through the Chief Scientist). The Voyage Manager is also responsible for supervising the CSIRO support staff taking part in the voyage.

The ANU Chief Scientist is responsible for the management of the scientific research program and all other personnel taking part in the voyage. The Chief Scientist should direct any formal communications regarding the conduct of the research voyage to the Master through the Voyage Manager.

Medical Considerations

An International SOS (ISOS) doctor is taking part in the voyage at the request of the scientific program. While the primary role of the ISOS doctor is to support the scientific project staff, the Chief Scientist has kindly agreed the ISOS doctor may also provide medical support to any other personnel onboard in case of an emergency.

To enable the provision of any such medical support during the voyage, all onboard personnel including the P&O marine crew should complete the MNF Medical Declaration. This would provide the ISOS doctor with some medical history in the event emergency medical support is required. This declaration is to be completed prior to the voyage and will be only be used in the event of medical intervention being required. The declaration can be returned to the individual or destroyed at the completion of the voyage to comply with any medical-in-confidence concerns that may arise. The ISOS doctor is otherwise considered to be part of the scientific compliment of the vessel.

For insurance purposes, the sponsoring organisation of all voyage personnel should be advised that an ISOS doctor will be onboard the vessel and able to assist in the event of a medical emergency which may require a medivac. Should the sponsoring organisation's insurance company not agree with the involvement of the ISOS doctor, they should advise alternative means by which emergency medical services can be provided. The P&O Ship Manager, CSIRO MNF Operations Manager and Chief Scientist is responsible for obtaining advice from their respective sponsoring organisations in this regard.

Southern Surveyor Equipment

- Millipore Milli-Q Plus Ultra Pure Water System including spare Millipore QPak 1, Catalog Number CPM Q004R1
- 2 new rock dredges (complete)
- MNF CTD system: underwater unit and deck unit. (User supplied Seabird data acquisition, processing and storage system will be provided)
- 15 * 5L Niskin bottles
- 15 * 10L Niskin bottles
- Seabird SBE43 Dissolved Oxygen sensor. (May try on one deployment).
- Biospherical QCP-2300-HP Underwater Cosine PAR sensor. This is unlikely to be of any interest for this voyage.
- Wetlabs C-Star Transmissometer (660nm x 25cm beam).
- Chelsea 3598-c Aquatracker Fluorometer.
- EM300 swath mapping system
- 2 * CARIS windows work station
- Sonardyne USBL system
- 2 * USBL beacons (USBL beacons deployed on camera frame at users risk. Beacons deployed on rock dredge must be user supplied)
- 1* USBL calibration beacon
- Fish finder (real time bathymetric profiler).
- 19mm coring wire over the stern
- 8mm CTD cable (2 drums stbd side, 7000m each)
- 12mm towing cable (one drum aft deck, 2000m)
- 60 XBT's
- Operations Room, Wet Lab, Fish Lab, Chem Lab.

User Equipment

CSIRO Deep Tow Camera System

#1	250 kg Camera Cage Camera Cage	
#2	47.3 kg Orange SeaBattery	
#3	2.4 kg Plywood Plywood Tail Fin	
#4	42 kg Grey Fibre Box	(4) SeaLite and spares.
#5	35 kg Grey Fibre Box	Cables
#6	42 kg Grey Fibre Box	Digital Video Camera – Panasonic NV-DS33 EN/ENA, MiniDV with spares.
#7	42 kg Grey Fibre Box	Spares
#8	42 kg Grey Fibre Box	Camera System Accessories and Tools
#9	2 kg Green Bin	Tool Box Tools and Accessories

Water Chemistry System

#1 (Tan Pelican hardcase: 80x62x44 cm, 0.22 cu. m, est45 kg)

Seapoint Turbidity Sensors, cables, SNs
AIST Eh sensor systems, cables (2 ea), SNs
pH meter, bench, SN
pH meter, handheld, SN
pH electrodes, 3 ea.
Magnetic stirrers, 2 ea
Electrode stand/holder
2 oz pH sample bottles w/spinbars
Digital thermometers, 2 ea
Misc. support gear for pH and filtration
Filtration membranes, pads, petrislides, 300 ea
Chemicals, 4: none are regulated for shipping (MSDSs provided)
pHydrion potassium biphthalate buffer 4
• 200 powder capsules, < 500g
pHydrion potassium phosphate-sodium phosphate buffer 7
• 200 powder capsules, <500 g
Tris buffer 8, 100 mL
Silver-Silver chloride electrode filling solution, 15 2 oz bottles

#2 (Tan Pelican hardcase: 80x62x44 cm, 0.22 cu. m, est45 kg)

Filtration manifold #1
• Gast vacuum pump
• Savillex PFA filter holders, 6 ea
Chemical, 1: not regulated for shipping (MSDS provided)
#19 VWR Vacuum pump oil, 2 L

#3 (Tan Pelican hardcase: 80x62x44 cm, 0.22 cu. m, est45 kg)

Filtration manifold #2
• Gast vacuum pumps, 2 ea
• Savillex PFA filter holders, 6 ea
• Tubing (140'); connectors, valves & flasks (9 ea)

#4 (Gray hardcase: est80x62x44 cm, est0.22 cu. m, est45 kg)

PMEL MAPRS-ORPs (9 ea)
Chemical, 1: not hazardous, regulated to non-passenger AIR (MSDS provided)
• Ultralife U9VL-J Li batteries, 9V, 108 ea.

#5 (Wood shipping box: est61x35x35 cm, est0.08 cu. m, est60 kg

DSP&L Sea Battery, 24V, lead-acid non-liquid electrolyte

#6 (Shipping crate: est91x61x51 cm, est0.28 cu. m, est45 kg)

Overflow Items

General Items

– 8 * Laptops.

– SeaSoft software with data processing and storage systems

– VSAT Satellite Communications System: SEA TEL BROADBAND-AT-SEA; Transmit/ Receive system (MODEL: 6006KU-29 IN 76" RADOME) Manual included.

Special Requirements

VSAT System

The installation of the VSAT system, connection to ships network and policy for public usage is currently under discussion. It will likely involve the installation of a 20ft shipping container on the foc'sle deck container position (near the afterdeck crane) with the satellite dome secured on the container top.

Compressed Air Supply

Ships air supply required in or near Wet Lab at 80psi for helium sampling gear.

CTD Tow-Yo's

This voyage will require extensive use of the CTD for Tow-Yo operations. Tow-Yo's involve continually raising and lowering the CTD in the water column over extended periods of time while the vessel steams slowly forward (ie. towed yo-yo's). The length of each Tow-Yo will likely be governed by the life of the USBL beacon batteries which could be around 20 hours per deployment. MNF has a protocol for Tow-Yo operations which provides guidelines to operators for safe use of the CTD by this method. Limits set in these guidelines should only be exceeded with direct permission from the MNF Voyage Manager, who will assess the risk of CTD seafloor contact under prevailing circumstances.

MAPRS

The project will provide a number of small autonomous samplers called MAPRS which have been designed to be easily clamped to an 8mm cable by hand. These instruments (around 5) will be deployed on the CTD cable above the CTD package in perhaps 50m cable increments. This will involve deploying the CTD as usual, then clamping a MAPR onto the CTD cable at selected increments. This can be done with an operator on the hero platform by bringing the CTD cable within easy reach of the operator using the side A-frame.

Deploying MAPRS in this way will be a new practice for Southern Surveyor and will therefore require the development of a new procedure and associated JHA. Operations of this type do however hark back to the early days of oceanography, when sample bottles were clamped to the wire by hand before the use of CTD's became common practice. In this sense the operation is not new therefore the new procedure/JHA can be developed onboard during the voyage. Suffice to say that the most likely hazard to be mitigated will be that winch and operations staff may forget about the MAPRS during CTD retrieval after a long Tow-Yo operation with the associated risk of dragging a MAPR into the CTD block.

Lab space allocation

Wet Lab: helium sample crimper on bench on fwrd wall (by door) plus sink area stbd of that to change samples and rinse tubes, need room for two trunks 0.7m x 0.8m for vacuum filtration for particulates (could be stored elsewhere if needed)

Chem Lab: storage of sample crates, 0.7m of bench width on after-bench and sink area (near door) for pH gear

Chem Lab or Photo Preservation Lab: about 0.7 m width of bench space (in clean hood if available), may build sheet plastic closed area for trace metal work

Fish Lab: bench space for MAPRS, camera gear etc.

Personnel List

SS02/2009 Leg 1

Name	Affiliation	Role	Cabin
Lisa Baptista	Nautilus Minerals	Cruise Manager	Sci 1
Gary Massoth	Mass-Ex3 Cons.	Chief Scientist	CS
Peter Crowhurst	Nautilus Minerals	CTD Lead	Sci 2/3
Susan John	Nautilus Minerals	CTD Lead	Sci 2/3
Mohammed Saiyaz	Dept. Min. Res.	Fiji Fijian Observer	Sci 4/5
Ian Stevenson	Nautilus Minerals	Geophys	Sci 4/5
Anna Bradney	ANU Water	Sampling Lead	Sci 6/7
Rebecca Norman	ANU Water	Sampling Lead	Sci 6/7
Clayton Summers	MDC	Multibeam	Sci 8/9
Shaun Bloomer	MDC	Surveyor	Sci 8/9
Sisi Vaioleti	Nautilus Minerals	Tongan Employee	Sci 10/11
Gilbert Kalalo	ISOS	Doctor	Sci 10/11
* Drew Mills	CSIRO MNF	Voyage Manager & Electronics Support	Sci/Crew 2
* Bob Beattie	CSIRO MNF	Computing Support	Sci/Crew 3
* Tony Veness	CSIRO MNF S	wath Support	Sci Crew 4

SS02/2009 Leg 2

Name	Affiliation	Role	Cabin
Lisa Baptista	Nautilus Minerals	Cruise manager	Sci 1
Richard Arculus	ANU Chief	Scientist	CS
Alison Swaddling	Nautilus Minerals	Water Sampling Lead	Sci 2/3
Tarun Whan	Nautilus Minerals	ANU Student	Sci 2/3
Shannon Johns	CSIRO E&M	CTD Lead	Sci 4/5
Merinda Nash	ANU ANU	student	Sci 4/5
Kledy Koloa	Nautilus Minerals	Geophys/geo	Sci 6/7
Sean Plunkett	Nautilus Minerals	Geophys	Sci 6/7
Jonathon Hargraves	MDC	Surveyor	Sci 8/9
Rob Angus	Nautilus Minerals	CTD Lead	Sci 8/9
Hemaloto Tupou	Nautilus Minerals	Tongan Employee	Sci 10/11
Gilbert Kalalo	ISOS	Doctor	Sci 10/11
* Lindsay Pender	CSIRO	MNF Voyage Manager & Computing Support	Sci/Crew 2
* Karl Forcey	CSIRO	MNF Electronics Support	Sci/Crew 3
* Bernadette Heaney	CSIRO	MNF Swath Support	Sci Crew 4

* System Support Technicians as per AMSA requirements.

Professor Richard Arculus
Chief Scientist